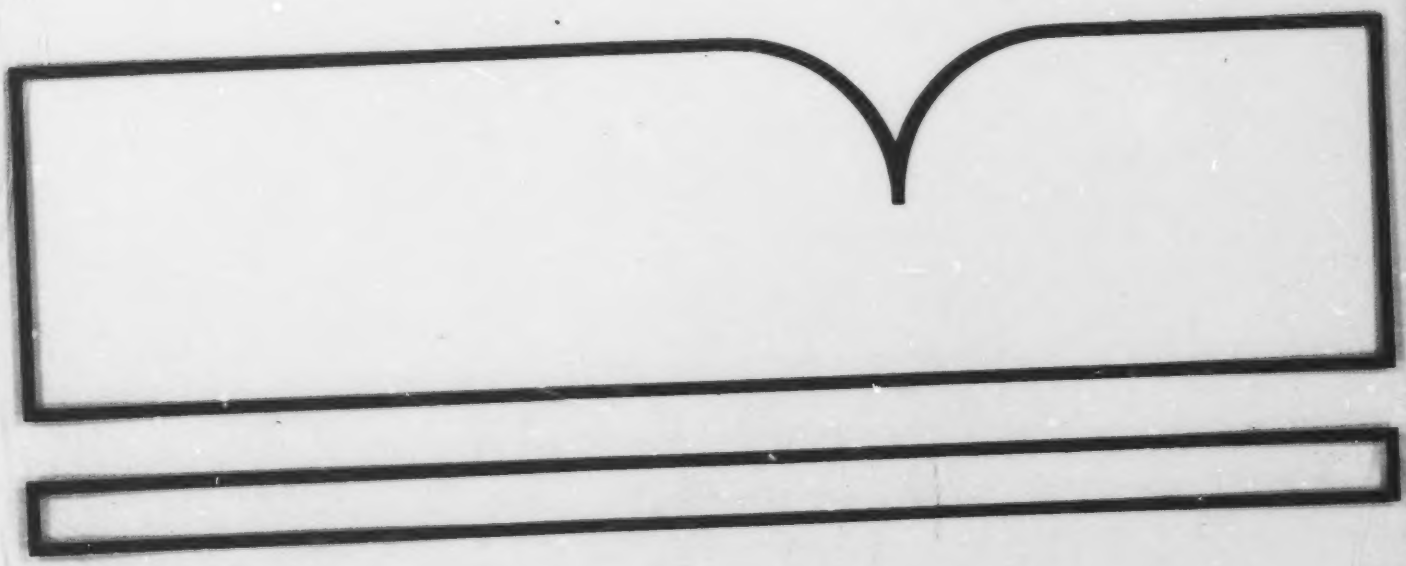
PB85-213858

Superfund Record of Decision (EPA Region 3)
Tysons Dump Site, Pennsylvania, December 1984

(U.S.) Environmental Protection Agency
Washington, DC

21 Dec 84



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Agency

Office of
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EPA/ROD/R03-84/008
December 1984

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EPA

Superfund Record of Decision:

Tysons Dump Site, PA

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15. SUPPLEMENTARY NOTES

16. ABSTRACT

The Tyson's Dump site is located in southeastern Pennsylvania, approximately 15 miles northwest of Philadelphia. The dump is an abandoned septic and chemical waste disposal site which operated from 1960-1968. Unlined lagoons were filled with wastes and covered, and new lagoons were created. Major contaminants found at the site were volatile organic compounds, primarily xylenes, toluenes, and 1,2,3-trichloropropane. In addition, chlorinated benzene compounds were also detected.

The cost-effective remedial alternative selected for this site includes excavation and off-site disposal of contaminated soils and wastes; upgrading of the existing air-stripping facility to treat leachate, shallow ground water, and surface run-on; and excavation and off-site disposal of contaminated sediments within the tributary which receives effluent from the existing air-stripping facility. The estimated capital cost for the selected alternative is $5,718,000 and operation and maintenance costs for five years are estimated to be $351,000.

Key Words: Excavation, Soil, Capping, Air Stripping, Ground Water, RCRA Landfill Standards, RCRA Locational Guidance, Deferred Decisions, Interim Measure

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Site Name: Tysons Dump Site, PA Contaminated media: sw, gw, soil, stream sediments Key Contaminants: VOCS, chloronated benzenes, xylenes, toluenes		

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RECORD OF DECISION

REMEDIAL ALTERNATIVE SELECTION

TYSON's DUMP SITE, UPPER MERION TOWNSHIP, PENNSYLVANIA

DOCUMENTS REVIEWED:

I am basing my decision principally on the following documents describing the analysis of cost effectiveness and feasibility of remedial alternatives for the Tyson's Dump Site:

- Remedial Investigation Report (Draft) Tyson's Dump Site, Montgomery County, Pennsylvania (Michael J. Baker, Jr., Engineers, Inc., August 1984)

- Feasibility Study Report (Draft) Tyson's Dump Site, Montgomery County, Pennsylvania (Michael J. Baker, Jr., Engineers, Inc., August 1984)

- Summary of Remedial Alternative Selection

- Recommendations by the Pennsylvania Department of Environmental Resources

DESCRIPTION OF SELECTED REMEDY:

- Excavation and off-site disposal of contaminated soils and wastes to a permitted RCRA landfill.

- Upgrading of existing air-stripping facility to treat leachate, shallow ground water, and surface run-on encountered during excavation. Operation of this facility is projected to remain on-line until residual ground water contamination is eliminated (est. 5 yrs.)

- Excavation and off-site disposal of contaminated sediments within the tributary which receives effluent from the existing air stripper.

DECLARATIONS:

Consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 C.F.R. Part 300). I have determined that excavation and off-site disposal of contaminated material and upgrading the existing treatment facility for continued treatment of liquids collected from the site is a cost-effective remedy which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, and the environment. The remedial action will be designed to minimize the risk of potential evacuation and temporary inconveniences to the local environment during the excavation and transportation phases.

The State of Pennsylvania has been consulted and agrees with the approved remedy. Following excavation of contaminated soils and wastes from former lagoon areas, operation and maintenance activites will be required to ensure the continued effectiveness and level of protection of the remedy. These activities will be considered part of the approved action and eligible for Trust Fund monies for a period of one year.

In addition, the off-site disposal of contamined soil and sediment to a secure hazardous waste facility is necessary to protect public health, welfare and the environment.

I am deferring selection of remedial response measures, if any, for the deep aquifer and floodplain/wetlands area. Additional studies will be conducted in the off-site areas to determine if off-site remedial action is required.

I have determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites.

DATE 12/21/88

Jack W. McGraw

Assistant Administrator
Office of Solid Waste and Emergency Response

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

TYSON'S DUMP SITE

SITE DESCRIPTION

Tyson's Dump site is an abandoned septic and chemical waste disposal site situated within an old sandstone quarry. As shown in Figure 1, the site is located in southeastern Pennsylvania, 15 miles northwest of Philadelphia, in Upper Merion Township, Montgomery County. Several former unlined lagoons were used to store various industrial, municipal, and chemical wastes. Spills and overflows reportedly occurred during the period of operation, thus allowing for the dispersal of wastes throughout the site. Surface water runoff and seeps also contributed to off-site migration of the wastes northeasterly toward the floodplain of the Schuylkill River.

The four acre parcel comprising the former lagoons is bordered both to the east and west by unnamed tributaries to the Schuylkill River, a steep quarry highwall on the south, and a Conrail Railroad switching yard on the north (see Figure 2). The Schuylkill River floodplain is on the opposite side of the switching yard. No structures exist within the old lagoon area and heavy vegetation obscures visual observation of contaminated areas. Vehicular access to the site is from Brownlie Road. An access road used during previous dumping operations runs along the northern portion of the site.

The major watercourse in the project area is the Schuylkill River. The average discharge at a nearby upstream station is recorded to be 1907 cubic feet per second (cfs). Flood elevations in the vicinity of the site are:

Flood Frequency	Elevation (feet above MSL)
10 year	70.5
50 year	77
100 year	80
500 year	87

Thus, over half of the area north of the railroad tracks is within the 10 year floodplain, while most of this area would be inundated by a 50 year flood and all of it would be covered by the 100 year flood. The site itself lies above the 100 year floodplain.(See Figure 2).

Tyson's Dump site is located within the lower member of the Stockton geologic formation outcrop area. Boring logs indicated that most natural soils appear to consist of a less than one foot thick layer of topsoil which is underlain to a depth of six to eight feet by clayey sand to sandy silt. This layer generally is underlain by fine to medium slightly silty sand with some gravel extending to a total depth of about 12 feet. Shallow bedrock in the vicinity of the site was observed to be highly fractured. A typical cross section is included as Figure 3

BASE MAP IS A PORTION OF THE U.S.G.S. NORRISTOWN, PA QUADRANGLE (7.5 MINUTE SERIES, 1966, PHOTOREVISED 1973). CONTOUR INTERVAL = 10'.

FIGURE 1

LOCATION MAP
TYSON'S DUMP, UPPER MERION TWP., PA

SCALE: 1" = 2000'

▲ DRINKING WATER INTAKE

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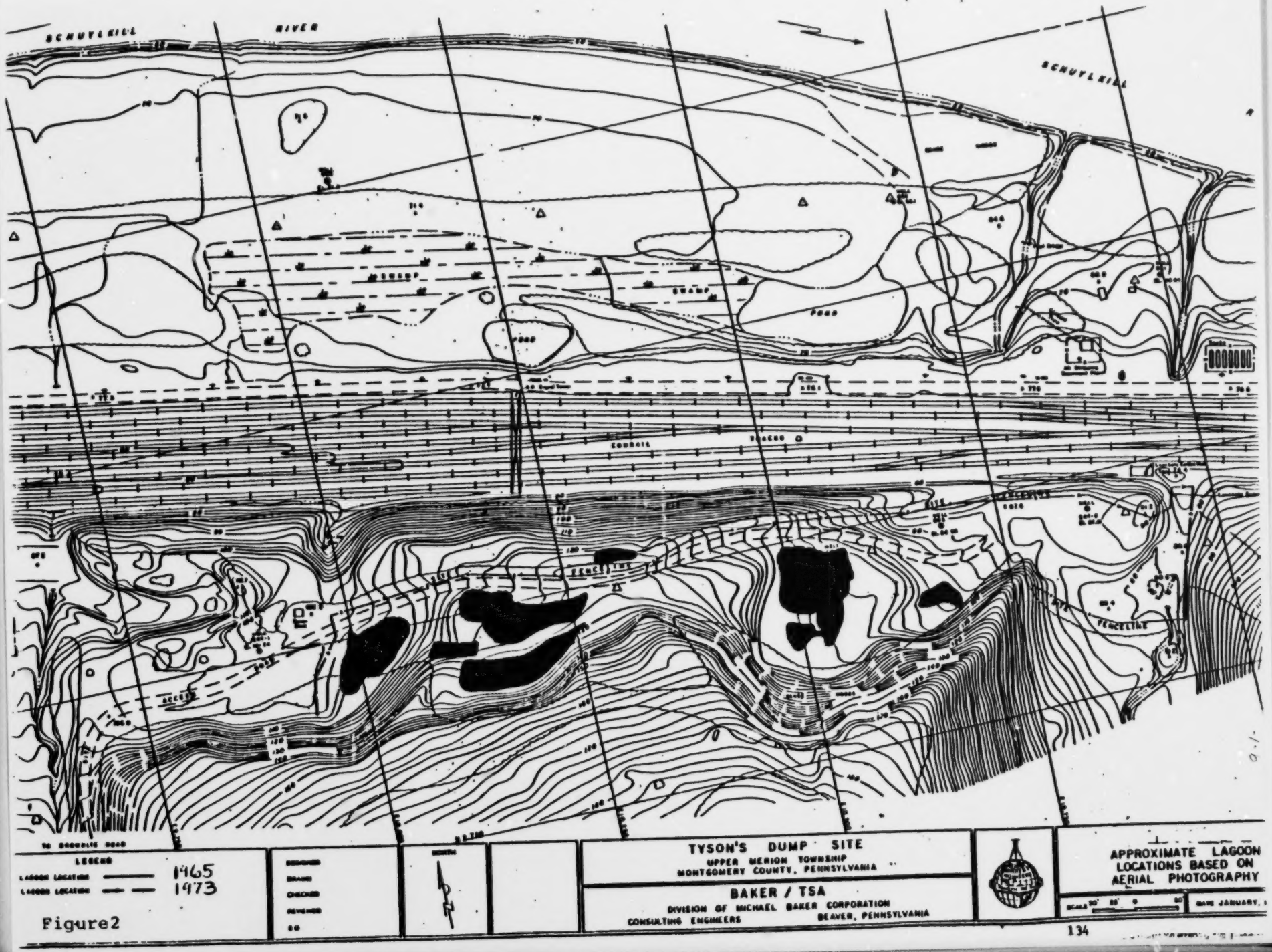
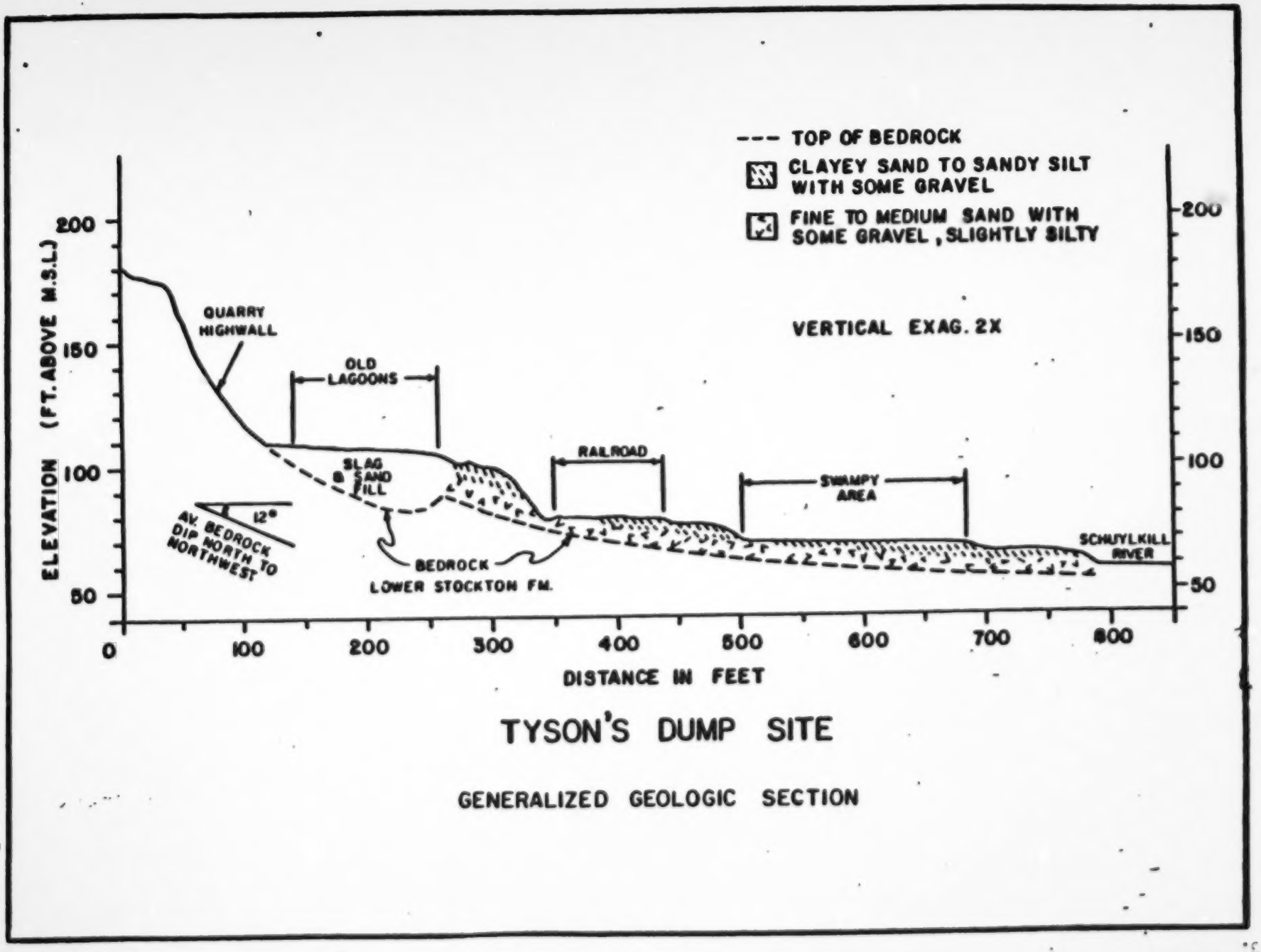

SCHUYLKILL RIVER
SCHUYLKILL
SWAMP
SWAMP
POND
POND
CONRAIL
TRACKS
FENCE LINE
FENCE LINE
TO CONRAIL ROAD
LEGEND
LAGOON LOCATION 1965
LAGOON LOCATION 1973
TYSON'S DUMP SITE
UPPER MERION TOWNSHIP
MONTGOMERY COUNTY, PENNSYLVANIA
BAKER / TSA
DIVISION OF MICHAEL BAKER CORPORATION
CONSULTING ENGINEERS BEAVER, PENNSYLVANIA
APPROXIMATE LAGOON LOCATIONS BASED ON AERIAL PHOTOGRAPHY

Figure2



TYSON'S DUMP SITE

GENERALIZED GEOLOGIC SECTION

FIGURE 3

Ground water underlying Tyson's Dump Site behaves as two hydraulically connected aquifers. The shallow aquifer within the unconsolidated sediments exhibits a different flow pattern than the deeper aquifer in the fractured bedrock zone. The shallow aquifer is characterized by high permeabilities while the deeper aquifer flow pattern (the major ground water aquifer of the area) is controlled by the degree of fracturing and fracture orientation. The shallow aquifer discharges through the floodplain/wetlands area to the river. The deeper aquifer is considered a Class II aquifer as defined in the dratt Ground Water Protection Strategy (GWPS).

Land use in the vicinity of the abandoned disposal site includes residential, commerical and industrial. Immediately adjacent to the site on the western border, is a newly developed residential subdivision. South of the site is zoned residential and agricultural while to the north, the zoning is heavy industrial. The Upper Merion Township as a whole is experiencing rapid growth with several new residential developments being recently completed or proposed. It is expected that land zoned agricultural will be re-zoned for high density residential use. Norristown is a large residential, commercial and industrial area with a population of 35,000 and is located across the Schuylkill River, approximately 1/2 mile northeast of the site. The smaller residential area of Briogeport, (population 4,900) is located approximately one mile east and downstream of the site. Belmont Terrace, which contains several hundred single-family dwellings, is located approximately 1/2 mile southeast of the site.

A January 1984 draft planning study published by the Delaware Valley Regional Planning Commission recommends that a four-lane arterial be built in Upper Merion Township. This proposed Schuylkill Parkway is proposed to be routed directly over the former lagoon areas.

SITE HISTORY

The dump was owned and operated from 1960 to 1968 by companies owned by Franklin P. Tyson and Fast Pollutant Treatment, Inc. Ciba-Geigy Corporation had used the dump to dispose of various wastes during the same time period. General Devices, Inc., the present owner of the site, purchased the property from Tyson in 1968 and claims they did not dump anything since they acquired it. During active operations, several lagoons were constructed within the old quarry pits. Former lagoon locations, approximated from 1965 and 1973 aerial photos of the site area, are shown on Figure 2. Reportedly, liquid septic tank wastes and sludges were hauled to Tyson's Dump in bulk tank trucks and then were disposed in the lagoons. Apparently, lagoons were filled with wastes and covered, and new lagoons were created. These operations were carried out throughout the site thus dispersing contaminants over much of the four acre area. Since lagoons were not lined, wastes were not prevented from migrating off-site via seeps and shallow ground water. Although disposal at this site supposedly was confined to septic tank wastes, the presence of hazardous constituents in soils and ground water indicates that disposal operations included chemical wastes.

In 1973, the Pennsylvania Department of Environmental Resources ordered the site owners to close the facility. During closure, the lagoons were to be drained, backfilled and vegetated and the lagoon contents transported off-site. Since closure, the site has been commercially inactive.

In January 1983, EPA investigated an anonymous citizen complaint about conditions at Tyson's Dump and subsequently determined that immediate removal measures were required to limit exposure to public health by uncontrolled chemical odors and liquid waste releases from the unsecured site. Nearby residents were traversing the site daily and children were observed by Conrail workers to be frequently riding motorbikes throughout the site. The Schuylkill River received surface runoff from the site and is used as a municipal water supply. Norristown's main drinking water intake (10 MGD) is approximately 2000 feet downstream in the south channel between Barbados Island and the site. A drinking water intake for the City of Philadelphia is located approximately 13 miles downstream. The river is also used as an industrial water supply for the area, in addition to its recreational use by the general public.

A large quarry pit, located approximately 1 1/4 miles south of the site, is used by the Philadelphia Suburban Water Company as a drinking water source. This reservoir provides between 5 to 10 MGD. The floor elevation of the pit is 229 feet below MSL. Several private residences using wells for potable water are located within 1000 feet south and southwest of the site.

The initial environmental site survey and sampling results indicated that a variety of hazardous chlorinated and non-chlorinated chemical compounds were present in the soils, air and water within and around the former lagoon areas (on-site) and in the floodplain (off-site). EPA's On Scene Coordinator decided to institute the following immediate removal measures in March, 1983:

- A security fence was erected to limit unauthorized access to the site.
- A leachate collection system was constructed to minimize uncontrolled contaminant discharges to the Schuylkill River and also to reduce volatile organic air emissions.
- An air-stripping leachate treatment system was installed to remove volatile organic compounds from collected leachate.
- An activated carbon air exhaust system was installed to trap liberated organics from the air-stripper.
- A partial site soil cap was placed over the suspected lagoon areas and hydroseeded.
- The area was graded to divert uncontaminated runoff from the old lagoon areas.
- An extent-of-contamination survey was conducted to determine the need for additional remedial measures.

Data generated from the initial field activities conducted by EPA (January-June 1983) indicated the widespread presence of organic compounds within and surrounding the former lagoon areas. These materials were not removed during closure and still are present in substantial concentrations. The major

contaminants found were volatile organic compounds (primarily xylenes, toluenes and 1,2,3-trichloropropane). In addition, chlorinated benzene compounds commonly were detected.

The data collected was used in applying the Hazard Ranking System to the Tyson's Dump site which resulted in an overall score of 63.10. Remedial Action Master Plan and Work Plan were prepared and approved in September, 1983. Funding for the Remedial Investigation and Feasibility Study was also approved in that month.

CURRENT SITE STATUS

Intensive field studies were conducted during December 1983 through March 1984 by Michael Baker, Jr., Inc. under subcontract to NUS Corpration. The findings and conclusions of the Remedial Investigation were submitted in August 1984.

Air Quality, as determined from volatile organic compound measurements had improved substantially subsequent to EPA's immediate removal actions. Results of air monitoring conducted December 1, 1983, revealed none of the 15 volatile organic compounds evaluated were present. Since winter conditions may have reduced or prevented the release of volatile compounds present in frozen surface or subsurface soils and other media, EPA requested that warm weather air monitoring be conducted to measure the potential for local adverse air quality conditions. Results of this monitoring did not reveal the presence of any of the volatile contaminants found during the subsurface soil sampling. Again, this may be attributed to EPA's emergency response.

Surface soils located in the central section of the fenced-in area were found to be highly contaminated with organic compounds. The level of organic compounds tend to decrease with increasing distance from the center of the site.

Indicator parameters and their isomers which were used in assessing the extent of surface soils contamination were chlorinated propanes and dimethyl benzenes (xylenes). The duplicate sample in the vicinity of the old lagoons had the highest reported values; compounds (or their isomers) which exceeded 100mg/kg included dimethyl benzene, ethylbenzene, methylbenzene, trichloropropane, hexadecanoic acid, and 2-chloro-10H-phenothiazine.

Low-lying areas downgradient from the site also show evidence of organic contamination. With the exception of Benzoic Acid, no other organic compound exceeded 6 ppm.

Metal concentrations in the surface soils exhibited no clear trend that would indicate that metal levels were higher or lower in a comparison of floodplain surface soils versus surface soils over the former lagoon locations. When these areas are subsequently compared to background levels (see figure 4), there is no significant difference. The field levels are also representative of typical soil concentrations as indicated by the reference levels.

Metal concentrations measured in surface water samples collected from the small tributaries, ponds, and the Schuylkill River did not exhibit any trends or patterns with regard to site influences. However, sampling was conducted during a period of low flow, and the streams and ponds were not receiving site runoff. Sediments provide a better indication of long-term conditions since typically the metals are sorbed onto solid matter and thus are more stationary, especially during periods of low flow. Sediment samples collected at each surface water sample location did not reveal an inorganic contamination problem (Figure 5). These concentrations were similar to those found in surface soils and thus may be due to native soil conditions.

Surface water samples typically contained only trace amounts of the Hazardous Substances List organic compounds analyzed. The two samples containing the most organic compounds were located in the tributary downstream of the leachate treatment plant discharge. Of the tentatively identified compounds determined to be in surface water samples, 1,2,3, trichloropropane was the most prevalent contaminant. This compound can be related to the site because the stations upstream of Tyson's Dump site either contained none of this substance, or for the Schuylkill River, only a trace amount. Figure 6 provides a summary of the occurence of the hazardous substanance.

Sediment samples taken in the tributaries, Schuylkill River, and ponds contained a wide variety of the tentatively identified compounds. The most frequently encountered substances were trichloropropane and methylated benzenes. Tracking the presence of trichloropropane in sediments, paralleled what was noted for this compound in surface water. Upstream of the site, there was little evidence of this compound, while downstream it was always present. A major area of concern on the floodplain is the gulley which receives the effluent from the present air stripping operations. These sediments were found to contain fairly high concentrations of 4-methylphenol (25,000 ppb) and 1,2,4, trichlorobenzene (44,000 ppb).

Metal concentrations above background were found in the ground water. However, these concentrations may not have been indicative of in-situ conditions since the samples were unfiltered (leaving sediments in the water), turbid, and acid preservatives may have removed metals bound to the sediment particles. A wide variety of organic compounds were detected in monitoring wells south of the railroad tracks. Contamination was also found to be widespread. Monitoring wells located in old lagoon areas contain high concentrations (generally exceeding 10,000 ppb) of a wide variety of organic compounds. Fewer organics were detected in floodplain wells (constituents rarely exceeded 100 ppb).

Figure 4

SURFACE SOIL COMPARISON FOR INORGANICS

Parameter	Sample Means			References		
	Background[1]	On-Site[2]	Floodplain[3]	Casarett[4] & Doull's	Lindsay[5] Low	Hi
Aluminum	7240	5220	5,580	81,300	10,000	300
Chromium	7.0	7.4	9.9	200	1	1,000
Barium	106	50	90	400	100	3,000
Beryllium	0.77	0.41	0.56	-	0.1	40
Cobalt	4.1	2.7	5.6	23	1	40
Copper	20	116	98	45	2	100
Iron	6280	4,015	11,100	50,000	-	-
Nickel	7.4	7.4	7.8	80	5	500
Manganese	222	63	230	1,000	20	3,000
Arsenic	7.4	5.1	9.2	2	1	50
Antimony	<1	<1	<1	0.2	2	10
Selenium	1.1	1.1	1.1	0.09	0.1	2
Thallium	<0.5	<0.5	<0.5	-	-	-
Zinc	24	47	51	65	10	300
Vanadium	12	<10	15	110	20	500
Silver	<0.5	<0.5	<0.5	0.1	0.01	5
Mercury	<0.1	0.48	<0.1	0.5	0.01	0.3
Tin	18	13	72	3	2	200
Cadmium	0.41	0.43	0.91	0.2	0.01	0.7
Lead	28	26	59	15	2	200
Tox	<100	118	<100	-	-	-

All values are in ppm

1. Samples used 840019, 840020, 840030, 840031, 840032, 840152, 840153, 840154

2. Samples used 840024, 840025, 840026, 840027, 840028, 840155

3. Samples used 840034, 840035, 840036, 840037, 840038

4. Toxicology by Casarett and Doull's, 1980, p410

5. Chemical Equilibria in Soils by W. L. Lindsay, 1979

Figure 5

UPSTREAM (BACKGROUND) VS. DOWNSTREAM (SITE INFLUENCED)

SEDIMENT COMPARISON

FOR INORGANICS

	Sample Means		
Parameter	Upstream [1]	Downstream [2]	Background Surface Soils
Aluminum	2410	4030	7240
Chromium	2.5	10	7.0
Barium	38	83	106
Beryllium	0.28	0.64	0.77
Cobalt	<2.5	7.3	4.1
Copper	16	25	20
Iron	2840	10,030	6280
Nickel	2.4	9.1	7.4
Manganese	104	577	222
Arsenic	3.8	6.4	7.4
Antimony	<1	<1	<1
Selenium	<1	<1	1.1
Thallium	<0.5	<0.5	<0.5
Zinc	27	106	24
Vanadium	<10	11	12
Silver	<0.5	<0.5	<0.5
Mercury	<0.1	0.24	<0.1
Tin	5.1	6.2	18
Cadmium	0.25	1.1	0.41
Lead	15	47	28
Tox	<100	<100	<100
Oil & Grease	123	301	

All values in ppm

1. Samples used 840044, 840058, 840072, 840074, 840151

2. Samples used 840046, 840048, 840050, 840052, 840054, 840056, 840060, 840062, 840064, 840066

Figure 6

TYSON'S DUMP SITE
SUMMARY OF 1,2,3-TRICHLOROPROPANE (OR ISOMER)
RESULTS BY SAMPLE TYPES

Sample Type	Frequency[1]	ESTIMATED CONCENTRATION Range	Mean[2]
1. Surface Water	12/16	ND[3]-2,400 µg/l	450 µg/l
2. Groundwater	6/21	ND-280,000 µg/l	13,500 µg/l
3. Surface Soils	17/26	ND-320,000 µg/kg	22,200 µg/kg
4. Subsurface Soils	21/24	ND-25,000,000 µg/kg	3,200,000 µg/kg
5. Sediments	12/17	ND-87,000 µg/kg	8,400 µg/kg

[1]Frequency is shown as number of occurrences above the detection limit per the total number of samples analyzed.

[2]Means calculated using a value of zero for all samples in which the compound was not detected.

[3]ND - Not detected or reported for sample.

Subsurface test boring samples confirm the major finding of the ground water monitoring. Extensive organic contamination on-site (concentrations often exceeding 100 mg/kg extending down to at least 20 feet in several areas) and minimal organic contamination on the Schuylkill River floodplain.

The environmental data collected at Tyson's Dump Site show that the most severely contaminated media are subsurface soils located in old lagoon areas. Thus the major pathway for the migration of contaminants off-site is via ground water movement through these lagoon areas. Based on monitoring well static water level measurements, the direction of shallow ground water flow is estimated to be slightly east of north, toward the river. Permeability measurements taken at various monitoring wells indicate that ground water traveling from the center of the site to the Schuylkill River would take approximately ten years (60 feet per year).

Since the site was previously a sandstone quarry, the topsoil and overburden were removed during mining operations. With bedrock outcrops observed to be highly fractured throughout the site and due to the nature of the previous mining operations, a serious threat exists because leachate is probably migrating vertically into the fractured bedrock zone as well as horizontally atop of the bedrock surface.

Other pollutant pathways include volatilization of organic compounds from surface soils and on-site seeps. The emergency measures undertaken by EPA in early 1983 appear to have dramatically reduced air quality problems, however, these were only temporary actions until a permanent remedy could be implemented.

Surface runoff of contaminated surface soils has been substantially reduced due to the site regrading conducted during the emergency action. Since the most severe contamination is confined to subsurface materials in the old lagoons which is effectively isolated from direct surface runoff, surface transport of organic compounds is limited.

The potential for health effects from direct contact with contaminated materials is estimated to be low outside of the fenced area with the exception of sediments downstream from the leachate air-stripper effluent outfall. Inside the fence line a threat does exist should handling of contaminated surface soils occur which can be absorbed through the skin. Disturbance and handling of subsurface materials from the former lagoon area could pose a more serious threat due to the high concentrations of numerous organic compounds below ground.

As indicated earlier, surface water downstream from the leachate treatment plant was the most contaminated. The plant is effective in removing many volatile organic compounds, however, its efficiency for reducing other organic compounds particularly xylenes and 1,2,3 trichloropropane is undoubtedly lower.

No ground water users are located between the site and the Schuylkill River, which is the direction of ground water flow. Several private water supply wells are located within 1000 feet of the abandoned dump but are hydraulically

upgradient in terms of ground water flow patterns in the area. Five residences sampled during the RI showed no evidence of contamination from the site. Ten organic compounds were detected in low concentrations in downgradient floodplain monitoring wells. This indicates that either dilution of contaminants has occurred or higher levels of contamination have not yet reached these wells.

The gross organic compound contents of on-site ground water and subsurface materials, even after the site has been inactive for more than ten years, demonstrates the persistance of contamination at Tyson's Dump site. One of the major site contaminants, tetrachloroethene, is a known animal and a suspected human carcinogen if ingested. Several other contaminants found on-site such as benzene and trichloroethene are also known animal and suspected to have human carcinogenic effects if ingested. Xylene, toluene, and ethylbenzene produce narcotic effects in high concentrations. Due to inhalation, ethylbenzene and trichloropropane are irritating to eyes, skin, and mucous membranes; dichlorobenzene and trichloropropane can cause damage to liver and kidneys and depression of the central nervous system if ingested. Phenol is highly poisonous either by inhalation, ingestion, or skin absorption. 4-Methylphenol (p-Cresol) can be absorbed through the skin and is known to cause kidney damage. It can also lead to a sensitvity reaction. The compound, 1,2,4-trichlorobenzene, can be absorbed through the skin and is an irritant.

ALTERNATIVES EVALUATION

The major objective of remedial actions to be taken at Tyson's Dump Site is to mitigate and/or eliminate environmental contamination present; (1) in the areas of the former lagoons which is roughly defined as within the fenceline, (2) the hillside between the former lagoon areas and the railroad tracks, and (3) the floodplain/wetlands. The overall strategy for former lagoon remedial action will be to implement source control techniques to confine or remove contaminated soils and subsurface materials as well as to ameliorate ground water contamination.

Off-site (the hillside and the floodplain/wetlands) concerns stem mainly from previous migration of hazardous constituents from the abandoned dump. Surface soil samples showed organic contamination in some areas. With the exception of the intercepted leachate and contaminated ground water between the hillside and the railroad tracks, subsurface soils and ground water contamination were found to be low as indicated by the RI. On-site remedial measures should focus mainly on assuring that the potential for additional contamination of these areas is minimized. A key aspect in determining whether off-site remedial measures are necessary is the resolution of the effectiveness potential protection factor associated with remediation of the scattered contamination found on the hillside and on the floodplain/wetlands versus the detremental effect of disturbing the wetland.

Initial formulation and development of potential alternative actions were based both on generic remedies and possible technologies applicable to these remedies. A summary of initial sreening of technologies is presented in Figures 7, 8, and 9. Initial screening of technologies was based on 1) the reliability/

Figure 7

SUMMARY OF INITIAL TECHNOLOGIES SCREENING PROCESS

Problem Type	Potential Technology	Screening Assessment
1. Air Pollution	Capping with clay, asphalt, etc.	- Hazard potential from airborne contamination does not warrant control measures based on RI data.
	Application of chemical sealants, fixants, stabilizers	- Hazard potential from airborne contamination does not warrant control measures based on RI data.
	Gas collection system with carbon adsorption system	- Gas generation from site not a problem; present air stripping leachate treatment system does employ carbon adsorption for exhaust vapors.
2. Soils/Sediments Contamination	Excavation/offsite disposal operation	- Viable option since most severe contamination is within a defined area (i.e., old lagoons).
	Site capping	- Viable option to prevent direct contact with contaminated surface soils and to reduce leachate generation.
	Application of chemical sealants	- Unproven technology given type of chemical contamination in surface soils; may be interference with sealant properties. Require pilot or bench scale study using site soils.
	Encapsulation	- Considered unproven technology for use at this site.
	Bulkhead construction	- Due to large volume of contaminated soils and physical characteristics of the site, this technology judged to be infeasible without large capital expenditures to modify site (i.e., extensive excavation, much of which would be in bedrock).

-7-a

Figure 8

- Continued -

Problem Type	Potential Technology	Screening Assessment
2. Soils/Sediments Contamination (Continued)	Chemical fixant/solidification	- Judged to be unproven technology for large volume of chemical wastes.
	In-situ treatment	- Position of wastes, difficulty in verifying success and the requirement of a significant effort to test methods prior to determining feasibility eliminates in-situ treatment as a technology for future consideration.
	Onsite landfill	- Viable option for isolating wastes/contaminated subsurface soils.
	Flushing	- Waste characteristics (low water solubility) and potential for spreading contamination (particularly into deeper aquifers) rules out flushing.
3. Contaminated Groundwater	Upgradient diversion via barriers	- Possible technology although past disposal of wastes practically against the old quarry highwall limits area in which to construct an upgradient barrier.
	Upgradient pumping	- No suitable locations to place upgradient wells to divert groundwater from site.
	Upgradient trenches	- Insufficient area to excavate trench onsite.
	Interception trench/subsurface collection drains	- Viable alternative if coupled with groundwater treatment.

Figure 9

- Continued -

Problem Type	Potential Technology	Screening Assessment
3. Contaminated Groundwater (Continued)	Well pumping system	- Possible technology, but would provide the same effect as trench. Trench preferred because it is a passive method not requiring collection pumps and should be more effective in collecting shallow groundwater migrating off site.
	Permeable treatment beds	- Insufficient area to install beds; potential for shortcircuiting; doubtful that treatment would be successful in removing chemical constituents.
	Offsite disposal	- As long as buried wastes remain in place, removal and offsite disposal of groundwater would be necessary. Disposal costs high.
	Onsite treatment	- Possible measure since leachate treatment plant already at the site (although upgrading system necessary).
	In-situ treatment	- Insufficient proof that method would be successful. Would require bench scale, then pilot plant studies before feasibility determined.
	Dilution	- Potential for forcing contaminated groundwater into deeper aquifer; no known aquiclude underlying site to prevent this from occurring. Also potential for increasing offsite contamination, increasing contaminant migration rate and levels toward Schuylkill River.

effectiveness of the technology in protecting the population and environment potentially at risk from site contamination, 2) the engineering feasibility of the technology for implementation at Tyson's Dump and 3) costs involved of installing or implementing the technology.

The initial screening process resulted in a reduced list of possible remedial actions for further evaluation. These alternatives selected for consideration, addressing both on-site and off-site contamination, are listed in Figure 10.

ON-SITE AND HILLSIDE REMEDIAL ALTERNATIVES

ALTERNATIVE 1. EXCAVATION/OFF-SITE REMOVAL

This alternative consists of excavating the contaminated soils, fill material, and wastes (est. total volume approx. 30,000 cu. yds.) and transporting these to a secure permitted landfill with a double liner, double leachate collection system for disposal. Excavation limits will be based on organic contamination found on the surface and on bedrock depth at the locations of the former lagoons and well-defined quarry pits. Removal of contaminated materials is a highly effective, permanent (useful life) solution to prevention of 1) hazardous subtances migration off-site and into ground water, and 2) direct contact exposure with contaminated soils. It is highly reliable as successfully demonstrated at previous sites and requires little or no operation and maintenance.

Criteria for excavation will be based on removal of unconsolidated materials down to bedrock in the lagoon areas. The lateral extent of excavation will be based on detectable background levels in the on-site area. Contaminated ground water/bedrock will be dealt with through the waste management treatment process to assure that hazardous substances do not continue to migrate into the ground water. Under RCRA, a facility needs to remove waste to background levels or cover area with a cap. A cap in this situation would not be desirable since any residual contamination could be flushed out and treated in the waste management treatment system.

Shallow contaminated ground water encountered within the excavated areas will be routed to an upgraded treatment facility, and then discharged in similar fashion as the present air-stripping system. Air-stripping will reduce the amount of hazardous substances discharged to levels which will assure protection of water quality. The treatment system is located in the flood plain and will be designed to protect against washout. With excavation only planned to occur in the former lagoon locations, an off-site remedial measure is necessary to handle residual leachate and shallow contaminated ground water within the steep hillside between the former lagoons and the railroad tracks. Residual flow collected in the existing interceptor trench installed during the removal will be processed in the upgraded treatment facility. Effluent from this facility will then be discharged to the same tributary which is currently receiving the air stripper's effluent. This is estimated to continue for about five years as clean shallow ground water purges this area. Acceptable levels of contaminants in the ground water will be established in the off-site ROD. These levels will assist in the determination of when additional treatment of ground water is no longer needed.

A sufficient number of monitoring wells (at least four) designed for potential ground water recovery will be installed during the design phase to determine if the lower aquifer is contaminated. Additional monitoring wells may be necessary due to the invariability of the Stockton Formation, the complexity of ground water flow in this aquifer, and the heavy immiscible compounds such as the 1,2,3 trichloropropane; it is conceivable that the contaminant plume may bypass this monitoring system. If these wells do not indicate contamination in the deep aquifer, it will support a no-action solution. Should contamination be present, a subsequent RI/FS will be necessary to determine lateral extent and levels of contamination, and to identify proposed remedial measures to address such contamination.

This alternative would require improving the site access road to haul hazardous materials out by truck and rehabilitating the local township roads due to the movement of heavy equipment and truck traffic.

Air emission controls and surface water run off controls will be implemented during the design phase to minimize releases. However, a temporary evacuation plan for local residents and other safety measures can adequately address these concerns.

ALTERNATIVE 2. - SITE CAPPING AND GROUND WATER DIVERSION

This alternative involves sealing the areas overlying the former lagoons with an impervious material and controlling the movement of ground water through these areas. Utilizing both a synthetic liner and a clay cap is highly effective in preventing 1) surface water infiltration, 2) volatile organic air emissions, and 3) direct contact exposure with contaminated soils. If the grout curtain is successful in diverting ground water away from the contaminated subsurface materials, the major pathway for off-site pollutant migration would be eliminated.

The reliability and useful life of these techniques would be determined by the long term integrity of the surface cap, the ability to install a continous barrier, and the compatibility of the grout and waste materials.

Primary operation and maintenance requirements associated with this action consists of (1) using the present leachate and shallow ground water collection trench, and (2) routing this flow to an upgraded treatment facility and discharged similar to Alt. 1. This shallow ground water management scheme will remain operational until flows are eliminated as a result of the source control measures. The need for deep aquifer actions would be assessed as discussed in alternative 1.

In evaluating this alternative with reference to site characteristics,

there are several disadvantages. Difficulties are expected in anchoring the surface cap into the quarry highwall. In addition, wastes may be incompatible and could cause the grout curtain to fail. Due to fractured nature of the bedrock a continuous grout curtain is complicated to install and it is difficult to ascertain whether a complete barrier to ground water flow is established. Should the grout curtain fail to provide a complete barrier, the contaminants would continue to migrate through ground water transport off-site. In addition, upwelling of the ground water into the contaminated area is anticipated and therefore would allow the contaminants to continue to migrate. Finally, contamination could move into deeper aquifer through fractures, and if so probably would not be intercepted by leachate collection trench.

ALTERNATIVE 3. - GROUNDWATER/LEACHATE COLLECTION AND TREATMENT; SURFACE SEALING OF CONTAMINATED AREAS

Under this alternative the contents in the old lagoons would remain undisturbed, while covering the surface with an impervious material to eliminate infiltration of precipitation. This should reduce the quantity of leachate generated but won't totally eliminate migration of wastes still in contact with shallow ground water. Any contaminated ground water/leachate originating from the site would then be collected in a deeper and longer interception trench similar to the existing collection system constructed during the immediate removal. A permanent and expanded treatment facility will be needed to handle the estimated collected flows (100,000 gpd).

As mentioned in the previous alternative, site capping can be effective in isolating contaminated materials from precipitation. Intercepting contaminated ground water/leachate can be effective in reducing further off-site migration of hazardous substances. Treating this contaminated flow will diminish quantities of hazardous compounds contained in the site. These techniques are proven measures which have been applied to uncontrolled hazardous waste sites. Clean-up of contaminants is achieved through long term collection and treatment of the ground water/leachate (Greater than 30 years).

A major unknown is the percentage of contaminated ground water/leachate which will be intercepted since the two existing aquifers are hydraulically connected. If the upper zone of bedrock is as highly fractured as indicated from observations of outcrops and test boring information, then it is likely that these fractures serve as conduits for deep ground water flow and migration would not be intercepted by the trench. Again, as described in the previous alternative, the wastes remain on-site. A treatment facility capable of producing an acceptable high quality effluent will warrant daily inspection and probably periodic replenishment of activated carbon for probably greater than 30 years as compared to other alternatives, which would require treatment for approximately 5 years.

ALTERNATIVE 4. - CONSTRUCTION OF AN ON-SITE, SECURE LANDFILL

Placement of wastes and contaminated soils in a properly designed and constructed on-site landfill will reduce off-site migration of hazardous constituents through ground water or air, and prevent direct contact with contaminated

soils. A double-lined system with leak detection and leachate collection should have a useful life of greater than 30 years. The level of clean-up would be similar to the excavation alternative. Operation and maintenance requirements entail perpetual ground water monitoring and inspection of the leak detection and leachate collection systems. The landfill portion of the site will be permanently restricted. The present air-stripping facility would also need to be retrofitted based on results of a treatability study of the leachate. The Hillside subsurface soil contamination will be handled similarly as described in Alternate 1.

RCRA permitting personnel from Region III reviewed the site characteristics and location and compared that to their locational guidances. The determination was made that it was highly unlikely that a RCRA Landfill would be permitted at the Tyson's site location, for the reasons indicated below as "critical factors". In addition, the cost estimate in the feasibility study could be increased by approximately $800,000 or more to address other factors. The problems associated with establishing a landfill in this location (eg. foundation, liner and slope stability, need for additional ground water monitoring wells) could effect the quality of installation and also result in a further increase in cost. (See Appendix A for more specific detail). Following are the critical factors viewed as disadvantages for the on-site, secure landfill.

CRITICAL FACTORS

Protected Lands - Siting of a landfill near protected lands such as wetlands is not recommended based on the potential detrimental effect the landfill could have on these lands if releases occurred and were not remediated in sufficient time.

Ground Water Monitoring - Monitoring must be established at a landfill to immediately detect contamination release. Due to fracturing in the bedrock, releases could occur without being detected in monitoring wells. Also, fractured bedrock would significantly increase the difficulty of cleaning up any contamination.

Ground Water Vulnerability - Time of travel to target areas (wetlands and surface water drinking intakes) is much less than the recommended time of 100 ft in 100 years. At Tysons, time of travel is 100 ft in 10 years.

Time to Achieve Remediation - The on-site RCRA landfill would require the longest amount of time to achieve remediation (the excavation and Off-Site Removal Alternative is expected to require only 6 months). Delays in remediation would allow further migration of leachate from the former lagoons which may increase both lateral and deeper contaminant levels, and place an additional burden on the temporary measures installed during the immediate removal.

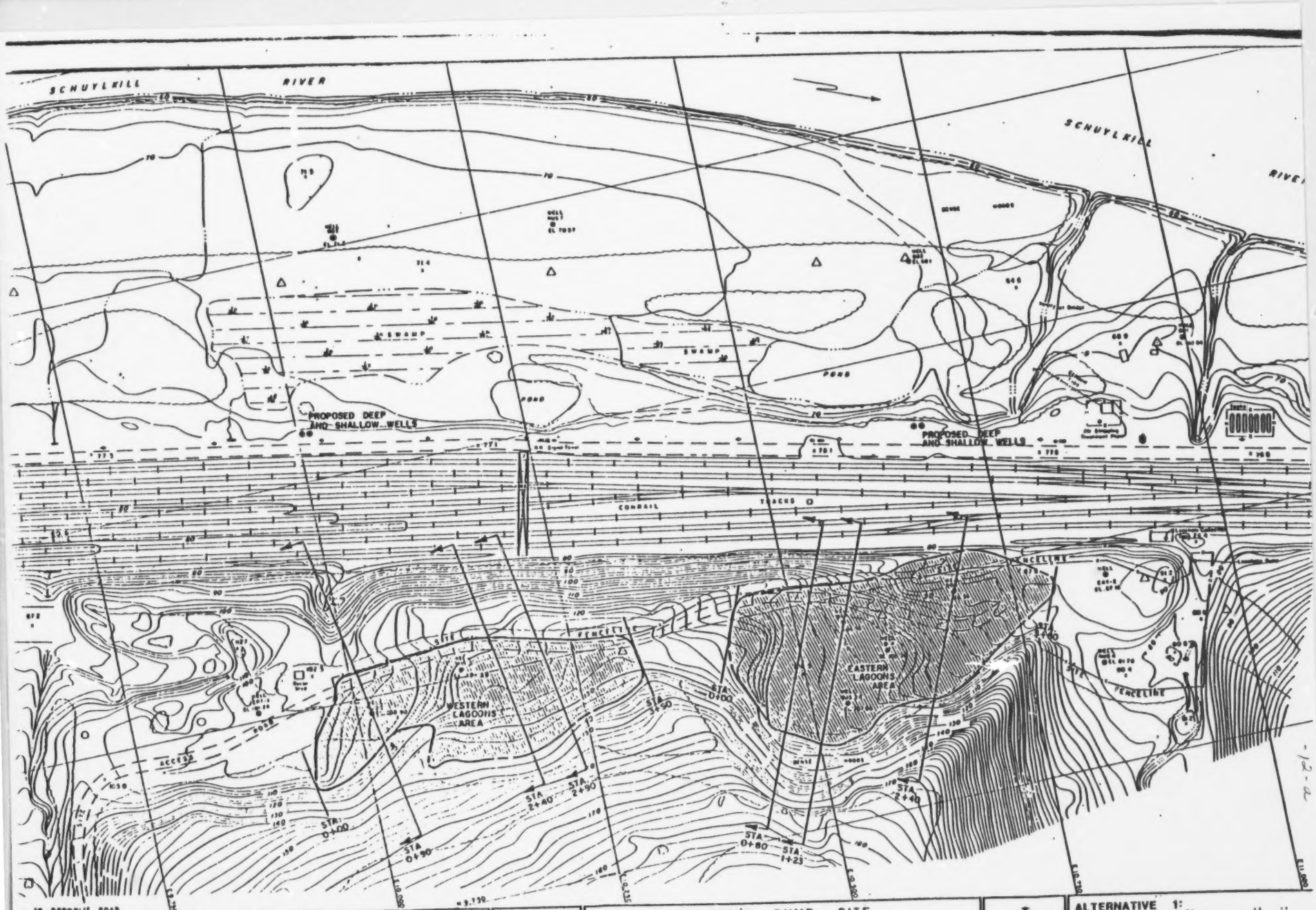
ALTERNATIVE 5 - NO ACTION

This alternative represents a situation where there would be no further remedial actions implemented on-site. Although the leachate collection and air-stripping equipment does reduce air emissions, it does not reduce all organic concentrations in the leachate prior to discharging to a tributary of the Schuylkill River. Ground water vulnerability of the Class II aquifer and impacts to floodplain/wetlands and the downstream river intake necessitates isolating/removal on-site wastes. Without eliminating or isolating the contaminated subsurface soils and preventing migration of contaminated ground water, the site probably will revert to a situation similar to that which existed prior to EPA's emergency response actions which would be a reoccurance of localized air emissions, additional ground water contamination seeps from the hillside, and contaminated surface water run-off. In addition, surface soils, through erosion and dissolution processes, could contribute to contamination of surface waters on and off-site. Contaminated subsurface materials in direct contact with the shallow ground water or through downward migration of surface precipitation will adversely affect ground water quality. Additional intermingling of contaminanted soils with the rising ground water table would also increase contamination to the ground water. Thus direct contact threats and additional environmental contamination from the migration of the contaminants into the ground water and wetland area would continue.

OFF-SITE REMEDIAL ALTERNATIVES

The evaluation and selection of off-site remedial action is being deferred with the exception of the tributary that recieves air-stripper effluent. Due to high organic levels in the sediment, which are presently a direct contact threat, approximately 50 cubic yards will be excavated from the tributary and disposed of off-site at a RCRA landfill. This is considered to be an interim measure. A determination if futher remedial action is needed will be made in the off-site ROD. The factors for deferal are:

(1) the four existing monitoring wells in the floodplain/wetland area will be further sampled using field filtered methods to obtain accurate results for the metal concentrations in the ground water



LEGEND
W MONITORING WELL LOCATIONS
AS OF EXCAVATION

Figure 1D

DESIGNED
DRAWN
CHECKED
REVIEWED
NO

NORTH

TYSON'S DUMP SITE
UPPER MERION TOWNSHIP
MONTGOMERY COUNTY, PENNSYLVANIA

BAKER / TSA
DIVISION OF MICHAEL BAKER CORPORATION
CONSULTING ENGINEERS BEAVER, PENNSYLVANIA

ALTERNATIVE 1:
EXCAVATION AND REMOVAL TO SECURE OFFSITE LANDFILL

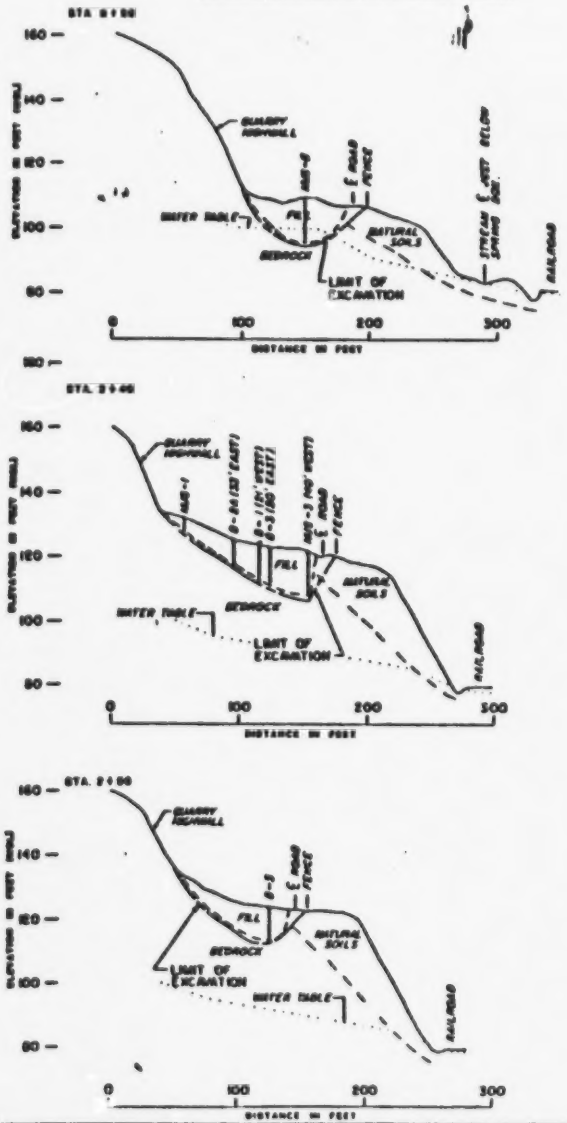
SCALE 50 25 0 50

DATE JUNE, 1984

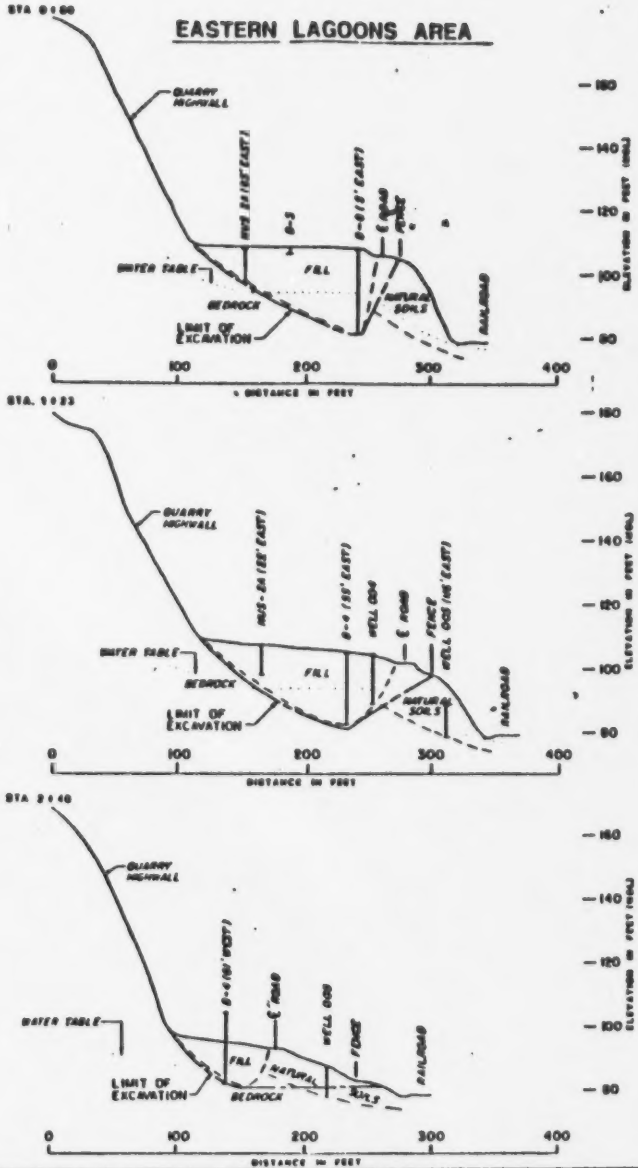
Reproduced from best available copy.

-12-

WESTERN LAGOONS AREA



EASTERN LAGOONS AREA



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REVISIONS	DESIGNED DRAWN CHECKED REVIEWED DD	NORTH		TYSON'S DUMP SITE UPPER MERION TOWNSHIP MONTGOMERY COUNTY, PENNSYLVANIA BAKER / TSA DIVISION OF MICHAEL BAKER CORPORATION CONSULTING ENGINEERS BEAVER, PENNSYLVANIA	CROSS - SECTIONS USED TO APPROXIMATE EXCAVATION QUANTITIES SCALE AS SHOWN DATE JUNE

Figure 11

(2) A wetland assessment will be done in order to better determine the benefits and/or detriments that any remedial action would have on the wetland area

(3) A biological study will be done in order to better determine any effects that off-site contamination would have on the wildlife in the wetland area

For purposes of an interim cleanup measure, based on a toxicological assessment (attached) * The levels to be removed are as follows: above 500 ug/kg for 4 -methylphenol and 2 mg/kg for 1, 2, 4, trichlorobenzene.

CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

Alternatives were examined in light of relevant Federal, State, and local environmental program requirements for actions such as disturbance of floodplains, temporary and permanent discharges to the Schuylkill River for treated wastewater, air emissions from the treatment plant and disturbances of contaminated soils, and RCRA requirements for new landfill facilities or existing landfills to receive excavated wastes.

The design and construction of the upgraded treatment facilities will be coordinated with the State to assure that receiving water and air quality will be aduquately protected.

RECOMMENDED ACTION

Section 300.68(j) of the National Contingency Plan (NCP) states that the appropriate extent of remedy shall be determined by the lead agency's selection of the remedial alternative which the agency determines is cost-effective (i.e., the lowest cost alternative that is technologically feasible and reliable) and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, or the environment. Based on our evaluation of the cost-effectiveness of each of the proposed alternatives, the comments received from the public, and information received from the Pennsylvania Department of Environmental Resources, we recommend:

FORMER LAGOON AREA - Source Control Measures. Excavation and off-site disposal of contaminated materials at a permitted RCRA landfill in compliance with the current off-site disposal policy.

HILLSIDE AREA - Off-site Remedial Measures. Continued use of existing leachate and shallow GW collection trench. Upgrading air stripper to treat flows. Discharge to tributary which is currently receiving air stripper effluent. Further studies will be conducted to determine if removal of surface soils will be necessary.

FLOODPLAIN/WETLANDS -Interim remedy of selective excavation in the tributary which receives air stripper effluent to decrease direct contact threat and enviornmental damage. Final decision on Floodplain/wetlands remedial action will be made in off-site ROD.

The alternative of excavation and off-site disposal of contaminated soils, fill materials, and wastes to a permitted RCRA landfill was selected based on its reliability in eliminating the continued generation and off-site migration of leachate from the former lagoon locations and the continued contamination of both shallow and probably deep ground-water zones. Based on the results of soil borings, there are no appreciable clay layers between the fill in the former lagoons and the fractured bedrock. This condition leaves little doubt that the contaminants have a pathway into the fractured bedrock aquifer.

In defining, excavation limits must be carefully defined. Analytical data from test borings taken in former lagoon locations indicate that organic concentrations tend to increase with depth down to bedrock (approximately twenty-five feet at the deepest point). Based on aerial photographs of the former lagoon areas coupled with analytical results and cross-sections from the test boring program, it is believed that most of the unconsolidated soils and materials in these areas are contaminated by various organic compounds. Therefore, the maximum limit of excavation is estimated to be approximately 30,000 cubic yards and is represented on figures 11 and 12. This limit is also reflected

in the cost estimate for this alternative. An ongoing contamination detection program will be conducted during excavation to separate clean materials that could be used in site reclamation from contaminated materials. Any unconsolidated materials in where no contamination is detected above background soil levels will be used as clean fill on-site.

Excavation of unconsolidated materials and wastes is expected to progress without difficulty until encountering bedrock. The bases of the former lagoons are probably contaminated along with vertical fractures and deep ground water below the bases. Retrieval and/or containment of deep aquifer migration from the former lagoons will be further investigated.

In an effort to avoid creating a depression which would accelerate the natural flushing of the bedrock and the deep aquifer, and also to prevent the potential for direct contact should an upgradient flow of contaminated ground water occur, the excavated pits will be backfilled, and graded to prevent surface run-on and direct run-off. Site reclamation after removal will include grading, and revegetation to eliminate physical hazards from the excavation pits.

Prior to commencing excavation, the following measures will be implemented:

- Improving an access road to the site to handle the movement of heavy equipment and truck traffic.

- Upgrading and retrofitting the present air stripper to treat leachate, contaminated ground water, and surface run-on encountered during excavation. Design parameters for the upgrade will be based on a treatability study of the collected leachate and shallow ground water. This facility will also continue to operate after excavation until monitoring data indicates the quality of any residual flow is no longer contaminated.

- Formulating an air monitoring plan and temporary evacuation plan for protection of local residents.

Transport and off-site disposal of all solid wastes will be conducted in accordance with RCRA. Off-site incineration of excavated materials was investgated but due to the limited availability of commercial facilities, the time required to process the materials (minimum of three (3) years - no staging of wastes at incinerator) and the lowest estimated cost obtained ($21M, just for incineration), it was decided that the to landfill alternative was more appropriate. As a less expensive approach to transporting the excavated materials, "piggybacking" (rail and truck) was also considered but did not project significant cost savings.

The one area of concern off-site is the tributary which recieves the air stripper effluent. Concentrations of organics are much higher compared to other areas of the floodplain. It is estimated that fifty cubic yards of contaminated soil and sediment will be removed from the tributary where the air stripper discharge outfall is located. This involves excavating approximately

SUMMARY OF ALTERNATIVES

Alternative and Components	Costs ($K) Cap.	O&M	Public Health Considerations	Environmental Considerations	Technical Considerations	Other
1. Excavation and Removal	5,718 *	351	Temporary evacuation of local residents may be warranted. Potential for road spills and accidents during transport.	Eliminates future air and GW deterioration. Removes threat of direct contact w/onsite soils. Level of clean-up is maximized.	Contaminants will be removed to background or bedrock if possible. If a cap is needed, it will be decided in later ROD	A double lined LF in compliance with RCRA must be identified. Only alternative community feels is acceptable.
2. Site Capping and GW Diversion (Grout Curtain)	3,030	365	Contaminated soils still remain unlined· potential for deep aquifer contamination.	Components are not expected to achieve a high level of isolation of contaminated materials. Therefore, contaminants will continue to migrate into the environment.	Cap may be difficult to construct against quarry face. Effectiveness and reliability of Grout Curtain is highly suspect.	Does not meet closure requirements under RCRA. Time required for O&M is expected to be greater than 5 years therefore O&M costs should be higher than specified. Land use will be restricted
3. GW/Leachate and Collection Treatment· Site Capping	1,161	733	Same as 2. During interception trench installation, leachate will be exposed for a short term.	Percentage of intercepted GW is unknown since aquifers are hydraulically connected and fracturing occurs under site.	Installation of trench is not expected to capture contamination in deep aquifer and installation could cause additional fracturing. Cap may be difficult to construct against quarry face.	Land use will be restricted. Permanent treatment plant and long-term O&M commitment.
4. Construction of an On-site RCRA LF	3,138	415	Double handling of contaminated materials could cause increases in the possibility of temporary evacuation of local residences and worker saftey.	Best option of on-site long-term isolation and containing of contaminanted materials, however, additional GW, soil, and leachate contamination would occur during 3 yr construction period.	Inability to establish an effective GW monitoring system due to fracturing and the inability to detect and implement timely corrective action for GW. Site loc. difficulties	Land use will be restricted. Long-term O&M requirements.
5. No Action	0	448	This alt. will not correct or reduce migration of contaminated GW. Possible risk w/direct contact of contam. sed/soils.	Immediate removal measures are temporary in nature. Environmental threats increase to all pathways	Air stripper is only effective in reducing volitile constituents of leachate.	Known animal and suspected human carcinogens exist onsite in both subsurface soils SW and GW.

*Cost based on single-lined landfill facility. An additional $5 million has been estimated to remove contaminants to a double-lined facility.

the top six (6) inches of soil/sediment within the tributary from the outfall point to the Schuylkill River. Clean fill will be used to restore this area so as not to affect the original drainage pattern. Upgrading the air stripper facility will further prevent surface water and sediment contamination.

Removal and disposal of spent carbon cannisters from the existing air stripper will also be required regardless of which alternative was chosen. There are presently seventy-two exhausted cannisters which increase at a rate of four per month. Regeneration of the spent carbon will be investigated during design.

OPERATION AND MAINTENANCE

Post excavation activities include continued collection and treatment of residual leachate and contaminated shallow ground water. Monitoring, until data indicates that treatment is no longer required, will be performed periodically. It is anticipated that by removing the source of contamination, the quality of leachate and contaminated ground water will gradually improve so that the operation of the treatment system will no longer be warranted. This time period is estimated to be five years.

SCHEDULE

Approve Remedial Action (Sign ROD)	12/29/84
Amend Cooperative Agreement for Design	12/31/84
Complete Enforcement Negotiations	2/28/85
Start Design	March 1985
Complete Design	July 1985
Amend Cooperative Agreement for Construction	July 1985
Start Construction	Sept. 1985
Complete Construction	March 1986

EVALUATION OF ALTERNATIVES NOT SELECTED

The GW Diversion and Site Capping alternative was not selected due to the inability of this alternative to deal with the existence of shallow ground water and the threat to deep aquifer contamination. Some of the cross sections representative of different stations through the former lagoon areas show the shallow water table to be within the contaminated sub-surface materials (see figure 10). Higher water table levels would be expected than those measured during the remedial Investigation since in-situ ground water elevations taken during the winter would normally be lower when compared to elevations taken in the Spring. Even with an effective grout curtain the water table may well-up behind the curtain and again come in contact with contaminated materials.

The difficulty of constructing an effective grout curtain at this site (due to fractured nature of bedrock) lowers this alternative's reliability. Even if the barrier is originally structurally reliable, the existance of large hydrostatic pressures on one side and corrosive organic compounds on the other side

of the grout curtain raises the likelihood of diversion failure. Should this barrier not be fully effective, or later fail, there is no secondary or back-up protection which would prevent ground water flow through the contaminated soils, and therefore would result in futher migration.

The Collection and Treatment alternative was not chosen since the threat to deep aquifer contamination will not be mitigated. As noted earlier, this alternative will not assure that hazardous substances will not migrate into the ground water, moreover, since there is no means of estimating the quantities of hazardous substanceswhich may migrate into the ground water,this alternative is most inappropriate. With shallow ground water flowing toward the Schuylkill River, the intercepting trench should collect most of this flow. However, even with the trench constructed 5 to 10 feet deeper into bedrock (of which itself could cause additional fracturing), leachate which exits through the base of the unlined former lagoons into a fracture will very likely not be intercepted. As mentioned in the site description, the Stockton Formation aquifer is controlled by degree of fracture and fracture orientation. Heavier, immiscible organic compounds would pass below the intercepting trench even assuming that the general direction of flow in the deep aquifer is similar to that of the shallow aquifer. This collection and treatment alternative entails

This collection and treatment alternative entails longer and more complex operation and maintenance requirements than the other alternatives. Based on the potential for recontamination, due to the unlined former lagoons, this factor would lower the alternative's reliability. The service life of the surface cap if allowed to remain undisturbed can be considered permanent. Another drawback with this system is the problems which might be encountered during the operation and maintenance period,(eg. clogging of the interception trench, malfunction of collected flow pumps, a decrease in removal efficiency) then any extended break in operation would result in recontaminating the flood-plain/wetlands since there is no back-up system.

The On-Site Landfill was not selected based on various factors. The major drawbacks to this alternative are: 1) ground water vulnerability, 2) ground water monitorability, 3) potential impacts of protected lands, 4) double-handling of contaminated materials and hazardous wastes, 5) long time frame needed to acheive remediation. In light of these factors, the on-site landfill is not adequately protective of human health and the environment.

EVALUATION OF POTENTIAL RESPONSIBLE PARTY'S PROPOSED ALTERNATIVE

Ciba-Geigy, one of the potential responsible parties at this site, had submitted comments and also discussed in a meeting their recommended remedial actions to be implemented at the site. Their proposal is similar to Alternative

3 (Interception Trench; Treatment of Leachate/GW; Surface Cap) with several modifications.

Ciba-Geigy's proposed major modification to Alternative 3 involves the use of deep (20-30 feet) interception wells instead of the proposed (5-10 feet deep) interception trench. Their reasoning based on the belief that "by virtue of pumping the wells and creating cones of depression and areas of influence around the wells, water within fractures not directly penetrated but interconnected throughout the rock mass would result in interception of that water through the pumping wells."

A major defficiency in this alternative would be the potential for continued migration of contaminants into the lower aquifer. This particular remedial technology had been eliminated during the initial screening in the Feasibility Study report. It was judged to be ineffective because the wells would have to be spaced such that they are within the fractures in order to prevent ground water from bypassing this collection system, which is impractical. This was the basis for selecting a trench over downgradient wells. The trench would intercept more fractures.

Of additional concern is whether the migration of heavier organic contaminants will be toward the line of interception wells. Heavier contaminants tend to be affected by gravity rather than the ground water flow field. Even with additional interception wells installed on three sides of the site (Ciba-Geigy proposed only one line), the heavier immiscible contaminants will probably flow through the secondary structure of vertical joints and not necessarily along isotropic flow paths to the interception wells.

An important feature of the interception well strategy is developing cones of depression in an attempt to maximize collection of contaminated ground water. Although the Ciba-Geigy proposal does mention the collection of large quantities of ground water, there is no estimate as to these quantities during the design life of this alternative. It is expected that pumping will be continuous due to high yields characterized by the Stockton Formation and high water table levels in the vicinity of the site due to the area being an aquifer discharge zone. Very steep depression gradients will need to be maintained in order to direct contamination toward the wells. The extensive pumping and subsequent treatment requirements were not factored into the operational cost of the Ciba-Geigy proposal.

Ciba-Geigy's a second proposed modification to Alternative 3 is the installation of a freshwater recharge system (similar to an on-lot sewage disposal system) to accelerate the flushing and removal of contaminants from the former lagoon areas. The present (non-recharge) Alternative 3 estimates that migration of contaminants will last greater than thirty years based on the persistent nature of the contaminants, while Ciba-Geigy's modification would be intended to purge the former lagoon contents in a five to ten year period. Even if this could in fact be accomplished, the recharge operation would probably also drive the contaminants deeper into bedrock fractures, exasperating the threat to the deeper aquifer.

Ciba-Geigy Corporation also provided comments indicating that the Excation and Off-Site Removal Alternative is not desirable because of potential

adverse impacts to human health, engineering and technical constraints, and the low cost effectiveness. The Agency believes that the need to prevent further migration of hazardous wastes from the former lagoons into the underlying bedrock aquifer (a Class II aquifer), outweighs the risk of evacuation and the temporary inconveniences caused during the excavation of wastes.

Thus, at this site excavation/off-site disposal is the only alternative which is feasible, reliable, and provides adequate protection of public health, welfare and the environment.

ENFORCEMENT HISTORY

After discovery of a release of hazardous substances in January 1983 and prior to initiation of the immediate removal action, EPA gave notice and opportunity to perform the immediate removal action to General Devices Inc. and Frank Tyson. Both parties declined to take immediate action.

In April 1984 a CERCLA 107 cost recovery action was filed against General Devices Inc., Frank Tyson and Ceiba-Geigy Corporation (identified as a generator based on information received in response to a 104(e) response). The case was filed to recover the immediate removal costs and remedial response costs to date (amendments to the case will be made as remedial costs are incurred). The case is now in discovery.

On August 1, 1984, as the RI/FS was nearing completion, EPA sent notice letters to all three parties asking them to consider implementing EPA's chosen remedial action (although the action was not known at the time). Frank Tyson repsonded by stating he could not afford to take any action. Ceiba-Geigy and General Devices did not commit to taking any action, but did indicate an interest in engaging in discussions that could lead to a clean-up. On October 26, 1984, Ceiba-Geigy wrote to EPA and again stated they have not ruled out the possibility of voluntary remedial action and asked EPA not to make commitments to federally-funded remedial response until discussions are held.